# Fostering Sustainable Use and Conservation of Water in Chinese Cities

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## 1. Introduction

China is a country with limited resources of water. At present one half of the Chinese cities has the water shortage and one third of Chinese cities has insufficient water supply capacity. In addition the pressure of pollution and environmental degradation and serious waste of water led the water resources issue to a vital challenge for the economic development and a constraint in improving Chinese people's living standard at the 21 century. Therefore, we have to tackle the problem of the water shortage. The strategy of meeting the challenge and the major measure is to explore the new water resources and adopting policy of water conservation.

To study the issue of sustainable water use and water conservation in Chinese cities will provide significant support to the policy-making, regulatory control, technique and economy for relieving the water shortage problems of Chinese cities. Also it has a great implication and urgency for ensuring the sustainable urban development.

## 2. Present problems and challenge

### 2.1 Limited source and uneven distribution

China's total amount of the freshwater resources are about 28,000 hundred million cubic meter, which is only 6 % of the total water resources of the whole world. However it must meet the demand the economic development and living requirement of 25 % of the world population. The average water resources are 2,350 cubic meter per capita, which is ranked as 110 in the world. So China has been listed as one of the 12 countries which are facing most scarcity of water in the world. Even then this limited resources of water are distributed great unevenly geographically. 75 % of the surface water and 70 % of the ground water is available in the south part of China, which occupies less than 50 % of the whole territory. But in the populated northern and northwest part of China the industry and agriculture have been developed well but only owns 10 % of the surface water and 20 % of the ground water.

### 2.2 Constraint to the urban development

China is developing country under the conditions of rapid economic development. It is expected that before the year 2010 it will develop in an annual economic growth rate of 10 –8 %. Meanwhile the urbanization rate will increase from 21% to 35%. The water demand of the whole country will increase from 5,200 hundred million cubic meter to 7,200 hundred million cubic

meter. (Among the newly increased water demand two thirds will be the city's increasing demand). According to the statistics of the 570 cities nationally it is estimated that the daily water shortage has been already more than 15 million cubic meters. More than 260 cities face water facilities shortage with 124 in a cute distress of water resources. Excessive ground water extraction in 58 cities caused considerable ecological and geological damage. Water scarcity has already had impact on the normal life of more than 40 million urban population and at an estimated cost of US $24 billion in lost economic output each year. If this trend of water shortage continues it will no doubt become the important constraint for China's economic development and hinter the people's living standard improvement.

2.3 Pollution is adding to Water Scarcity

Pollution also contributes to water scarcity and is a major source of disease burden_ particularly for the poor. The water contamination caused by the rapid growth of municipal sewage discharge has become one on the major environmental problems in China According to the statistics data in 78% of urban watercourses, contamination has caused water quality beyond the 3$^{rd}$ grade classified in Surface Water Environmental Quality Standards_More than half of the ground water has been contaminated. At present the prevention and cure of water contamination is being implemented in the drainage areas of River Huai, River Hai, River Liao, Lake Tai, Lake Chao and Lake Dianchi. Many important measures have been taken such as to close down more than 5,000 industrial enterprises with severe pollutants. However, by the end of 1996 the waste water volume into the municipal sewage network was 20.9 billion cubic meters_However the treatment rate was only approximately 11.4 % among which second class bio-chemical treatment rate was only 9.3 %.

**3. Solutions and Measures**

Facing the serious challenge Chinese government is planning or executing the water diversion projects to tap more distant watershed. Such as the project of diverting Yangzi River to North China and Shandong Province- West Route and East Route Projects; the project of diverting Songhua River to Liaoning Province Project; the project of diverting Yellow River to Shanxi and Shandong provinces, etc. However these diverting efforts can only relieve a part of problems. The major solution and measure to resolve water shortage is opening the new resource and reducing the consumption of water. Now this has become the common awareness of most Chinese people. It is expected to produce a deep understanding by raising the people's water conservation awareness, to enforce the adjustment of the industrial structure and accelerate the technical renovation of water industry and equipment improvement, to strengthen and improve the operation and management practice, to efficiently consume water and utilize the recycling feature

of water and make water into a good circle and realize the pattern of sustainable use of water. This philosophy will be a sole solution of alleviating the water shortage of our cities.

To achieve the above-mentioned goal we have to study the urban water supply and water conservation management in order to set up a pattern of water supply and conservation pattern. By providing the concerned policies and building capacity, regulation, technical and economic approaches for the city level authority and proposals for a pilot study in a scientific and available way in order to support cities in a sustainable use of water and conservation.

**4. Progress on Water Conservation of Chinese Cities**

Apparent Progress on water conservation has been got in past decades. Since the water conservation is a vital for ensuring the water demand of the cities. The city authorities paid great attention on the work. Both the central Party Commission and the State Council has pointed out that the conservation of water at city level has been put in place of insisting the principle of opening resources and reducing the consumption making the resources in a rational distribution. Guided by this principle the local authorities gave a great priority on the conservation of water and made significant success. Since the year 1983 when the first national Convention of Water Conservation held till last year the saved water has been reached more than 20 billion cubic meters. The ratio of recycled industrial water use raised from less than 20 % till more than 60 %.

4.1 Public awareness has been deepened

Along with the emphasis on water conservation, the public awareness on saving water has been raised up. All walks of life and every household pay attention on conservation and people feels saving is glorious and waste is a shame. Since 1992 there is a Water Conservation Week nationally, during which the local leaders go to the streets to disseminate the significance of conservation. Meanwhile the media has played a role in promoting the public awareness.

4.2 Strengthening the regulation on conservation

The State Council has promulgated a series of regulations and legal laws on water conservation such as << Regulation on Water Conservation Management in Cities>>, <<The Regulation on The Development, Use and Protection of Underground Water in Cities>>, <<The Ordinance on the Supervision of Toilet Flushing Water Utensils>>, << The Ordinance on City Water Use Quota>>, etc.

4.3 The Improvement of Toilet Flushing Water Tank

In recent years it has got progress on the renovation of the toilet flushing water tank and promoting the water saving utensils in China. According to the incomplete statistic presently it has

4million sets of flushing water tanks and a great amount of the other sanitary utensil with the loss of more than hundred million cubic meters due to the leakage and wastage. So to resolve the problems of leakage has become the important and urgent issue in the conservation. For this a joint leading group of the Developing and Applying New Sanitary Utensil cosponsored by Ministry of Construction and State Building Materials Administration has been set up for executing supervision and management of the production and quality control of the utensils.

4.4 Industrial Water Saving

The technical renovation on industrial water use has been upgraded. There is steady progress on industrial water saving which is a key point of the city water conservation. Ministry of Construction has drawn << The Development Planning For Technical Improvement On Water Conservation Of Chinese Cities Till The Year 2010>> which will play important role in guiding the technical improvement of our national water conservation work.

4.5 Water Tariff Study

In China historically lack of proper water pricing also encouraged profligate use and wastage. The Price has been set artificially low and difficult to maintain sustainable operation and achieve sustainable water consumption. The average water price, 0.317 Yuan/cubic meters in 1994 was lower than the average cost of production. With unreasonable water pricing the Water Supply Companies (WSCs) are unable to provide good service and invest the new water infrastructure. Now it is widely understood that excessive water consumption is directly related to the low tariff. In Shanghai, water consumption fell by 3.8 % when the water price increased by 10 %. Significant tariff adjustment have been made over the past decade. Through the water tariff study the National Guidelines on Water Tariff Pricing has been by set out by the Ministry of Construction with a view to improve the cost recovery performance of WSCs and promote the sustainable use of water.

## 5. Recommendations for Future Water Management in Chinese Cities

The general objective is to set up a series of comprehensive policies on urban water supply and conservation according to the Chinese strategy of sustainable development policies_

- ❄ The legislative system and effective water policies should be strengthened to ensure sustainable use and water conservation_
- ❄ Based on the basic data collection_investigation and analysis on situation of water shortage, causes and trend, etc. a series of comprehensive policies for urban water supply and water conservation should be set up.
- ❄ The basic research work on the water tariff calculation system should be conducted in

order to make a reform on the pricing and management_A detailed tariff calculation methodology will be developed_tested and refined.

- To evaluate the existing institutions and practices a market mechanism should be implemented to improve the management of our water supply in a market-oriented way.
- The water consumption quotas for different urban sectors and comprehensive water conservation plans _including the bans and fines as well as encourage measures for saving behaviors_could be recommended to tackle the problem of urban water crises depending to the individual circumstances of cities.
- Studies on technical renovations of industrial recycling and water saving applicants, equipment's should be strengthened and the regulations on both production and marketing of the sanitary utensils for toilet should be established.
- Water use in society should be sustainable-with protection of the environment. Study on the construction and investment of municipal sewage disposal, the fee for collecting municipal sewage the technical policy on municipal sewage disposals should be strengthened.

We expect to promote the cooperation on the sustainable use of water and water conservation between the American and Chinese peoples. We would like to learn the good practices and approaches to the challenge posed by urbanization and current consumption pattern in human settlements in USA and we welcome the proposals for cooperation and technical exchanges on any field above-mentioned scopes. We are facing with many problems and challenges in urban development We have a long way to go. Saving water resources is the common goal of the mankind. Let us do our best to foster the sustainable use of our limited rescues-water.